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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is also included. (AG)

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TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

FOLDING-MACHINE OPERATOR (print. & pub.) 4-49.051

B-438 or S-172

TM 001 303

U. S. Employment Service in
Cooperation with
Pennsylvania State Employment Service

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
July 1961

GATB #2274
December, 1958

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR FOLDING-MACHINE OPERATOR 4-49.051

B-438 or S-172

Summary

The General Aptitude Test Battery, B-1002A, was administered to a sample of 50 men employed as Folding-Machine Operator 4-49.051 by 12 bindery companies in Philadelphia, Pennsylvania. The criterion consisted of supervisory ratings based on a descriptive rating scale. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes G-Intelligence, N-Numerical Aptitude, and Q-Clerical Perception were selected for inclusion in the test norms.

GATB Norms for Folding-Machine Operator 4-49.051 B-438 or S-172

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Folding-Machine Operator 4-49.051.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-438 or S-172

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1-H CB-1-I CB-1-J	90	G	Part 3 Part 4 Part 6	85
N	CB-1-D CB-1-I	95	N	Part 2 Part 6	90
Q	CB-1-B	85	Q	Part 1	85

Effectiveness of Norms

The data in Table V indicate that 12 of the 17 poor workers, or 71 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 71 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 26 of the 31 workers who made qualifying test scores, or 84 percent, were good workers.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Folding-Machine Operator 4-49.051.

II Sample

During the period October 1957 to December 1958, the GATB, B-1002A, was administered to a sample of 50 men employed as Folding-Machine Operator 4-49.051 at 12 bindery companies in Philadelphia, Pennsylvania. The names of the companies and the number of workers included in the sample for each company are shown below.

Company	Number
National Publishing Company	4
Dunlap Printing	1
Philadelphia Bindery	7
Periodical Press	8
Majestic Press	2
Hartman Bindery	3
Chilton Company	7
Sam Bless and Company, Incorporated	5
Bless Bindery	5
Edward Stern	2
Central Bindery	4
William and Marcus	2

All of the workers in the experimental sample had completed a period of apprenticeship either with their present employer or with other employers. All workers in the sample were considered experienced workers. The majority of the participating employers believed that a high school education was desirable but not absolutely necessary. Presently, unions require a four-year formal apprenticeship training period during which the apprentice learns to set-up and adjust, load, operate and maintain various types of folding machines. The apprentice is made a journeyman at the end of the four-year training period. On the job, journeyman receive general supervision by the foreman.

Table II shows the means, standard deviations, ranges, and Pearson product-moment correlations with the criterion for age, education and experience.

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TABLE II

Means (M), Standard Deviations (σ), Ranges, and
Pearson Product-Moment Correlations with the Criterion (r) for
Age, Education and Experience

Folding-Machine Operator 4-49.051
N = 50

	M	σ	Range	r
Age (years)	35.7	8.9	21-53	.011
Education (years)	10.0	1.6	5-12	.123
Experience (months)	123.9	99.5	10-396	.228

There are no significant correlations between age, education, and experience. The data in Table II indicate that this sample is suitable for test development purposes with respect to age, education, and experience.

III. Job Description

Job Title: Folding-Machine Operator 4-49.051

Job Summary: Sets up and adjusts, loads, and operates various types of folding machines. Performs general maintenance including lubricating, cleaning, repairing and replacing of machine parts.

Work Performed: Sets up and adjusts folding machine to produce final product with accuracy and minimum spoilage. Some set-ups may require as much as 1½ hours or longer in order to properly align the various sections of the machine.

Reviews specifications on order jacket to determine required set-up. Uses hand wrenches, pliers, screw drivers, wire cutters to adjust guides, tensions, rollers, rods, brushes to set feeds for various sectional folds.

Plans adjustments, taking into consideration type of paper, type and number of folds, type of layout, compensation for printing errors and other irregularities, size of paper. Tests set up with one or more sheets for alignment, correct foldings, pagination, etc. Makes adjustments if necessary. Verifies with order jacket to make certain that products meet specification. May verify with plant foreman before starting operation.

Loads and operates folding machines. Sets automatic buttons and observes take off. Inspects output from time to time to make certain that material is being properly folded according to specifications. Makes adjustments as needed. Keeps daily time record and number of sheets run. May hand over operation of machine to an apprentice as directed by foreman.

Performs general maintenance of machine including lubrication, cleaning, repairing and replacing machine parts in order to keep machine in proper running condition.

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IV. Experimental Battery

All the tests of the GATB, B-1002A, were administered to the sample group.

V. Criterion

The criterion consisted of supervisory ratings based on the Descriptive Rating Scale developed by the Bureau of Employment Security, Form SP-21. The rating scale consists of nine items covering different aspects of job performance with five alternatives for each item. Weights of one through five indicating the degree of job performance attained were assigned to each alternative. The ratings were made during the months of October 1957, January, March, June, and December 1958.

It was possible to obtain only one set of ratings. The majority of the participating employers stated that reratings would not differ to any great extent from the original ratings. Since only one set of ratings was available, the estimated reliability of the criterion was determined by obtaining the relationship between the total descriptive rating scale scores and the ratings on "Item I" (all around ability) of the scale. A reliability of coefficient of .910 was obtained for the descriptive rating scale criterion. The scores of the one set of ratings was used as the final criterion for validation purposes. The possible range of scores was 9 through 45. The actual range was 24 through 44 with a mean score of 32.4 and a standard deviation of 5.4.

VI. Qualitative and Quantitative Analyses

A. Qualitative Analysis:

The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation.

Intelligence (G) - required to acquire understanding of various types of folding machines in order to set up and adjust machines properly, to interpret job specifications, and to exercise judgment in setting up machines.

Form Perception (P) - required to inspect machines for loose or defective parts and to test set-up with one or more sheets for alignment and correct foldings.

Finger Dexterity (F) and Manual Dexterity (M) - required to use hand tools to load, operate, and maintain machines.

On the basis of the job analysis data, none of the aptitudes are considered obviously unimportant for performing the duties of this job. Therefore none of the aptitudes are considered "irrelevant" aptitudes.

B. Quantitative Analysis:

Table III shows the means, standard deviations, and Pearson product-moment correlations with the criterion for the aptitudes of the GATB. The means and standard deviations of the aptitudes are comparable to general working population norms with a mean of 100 and a standard deviation of 20.

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TABLE III

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

N = 50

Aptitudes	M	σ	r
G-Intelligence	96.5	15.2	.417**
V-Verbal Aptitude	94.9	15.0	.364**
N-Numerical Aptitude	95.9	14.9	.331*
S-Spatial Aptitude	97.9	18.4	.326*
P-Form Perception	94.9	15.0	.167
Q-Clerical Perception	98.9	11.1	.277
K-Motor Coordination	95.3	18.5	-.070
F-Finger Dexterity	94.3	19.0	.182
M-Manual Dexterity	95.6	20.0	-.015

**Significant at the .01 level
*Significant at the .05 level

Aptitudes G, N, S, and Q have the highest mean scores and aptitudes N and Q have relatively low standard deviations.

For a sample of 50 cases, correlations of .361 and .279 are significant at the .01 level and the .05 level of confidence, respectively. Aptitudes G and V correlate significantly with the criterion at the .01 level. Aptitudes N and S correlate significantly with the criterion at the .05 level.

C. Selection of Test Norms

TABLE IV

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important	X				X			X	X
Irrelevant									
Relatively High Mean	X		X	X		X			
Relatively Low Sigma			X			X			
Significant Correlation with Criterion	X	X	X	X					
Aptitudes to be considered for trial norms	G	V	N	S		Q			

Trial norms consisting of various combinations of Aptitudes G, V, N, S, and Q with appropriate cutting scores were evaluated against the criterion by means of the tetrachoric correlation technique. A comparison of the results showed that B-1002 norms consisting of G-85, N-90, and Q-85 had the best selective efficiency.

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VII. Validity of Norms

The validity of the norms was determined by computing a tetracheric correlation coefficient between the test norms and the criterion and applying the Chi Square test. The criterion was dichotomized by placing as close as possible to one-third of the sample in the low criterion group. A criterion critical score of 30 was used and resulted in 17 of the workers or 34 percent of the sample being placed in the low criterion group.

TABLE V

Validity of Test Norms for
Folding-Machine Operator 4-49.051
(G-85, N-90, Q-85)

N = 50

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	7	26	33
Poor Workers	12	5	17
Total	19	31	50

$r_{tet} = .71$ $\quad X^2 = 9.609$

$\sigma_{r_{tet}} = .23$ $\quad P/2 < .005$

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

VIII. Conclusions

On the basis of the results of this study, Aptitudes G, N, and Q with minimum scores of 85, 90, and 85 respectively, have been established as B-1002 norms for the occupation of Folding-Machine Operator 4-49.051. The equivalent B-1001 norms consist of G-90, N-95, and Q-85.

IX. Determination of Occupational Aptitude Pattern

The specific norms established for this study did not meet the requirements for allocation to any of the existing 23 occupational aptitude patterns. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.